

further noted that the subject matter as a whole would therefore have been obvious to one having ordinary skill in the art at the time the invention was made to have selected the overlapping portion of the subject matter disclosed by the references. The Examiner allows that the V content (0.1 to 1 wt.%) in Stroup is higher than the claimed V content (0.02 to 0.08 wt.%) of the present invention. The Examiner further states that this forms a prima facie case of obviousness in that the burden is therefore upon the Applicant to show that there are substantial, actual differences between the properties of the claimed compound and the prior art compound.

Lastly, the Examiner rejects claims 21-22 and 25 as being unpatentable over EP 594509, Matsuo et al. and Stroup. The Examiner allows that none of the art recites holding the Al based alloy at its melting temperature, but that Al based alloy in the foundry is known to be held at the melting temperature 750° before casting.

Applicant believes it most useful to rebut the prima facie case of obviousness cited by the Examiner by briefly discussing the problem solved by the present invention. By so doing, it becomes evident that not only does the present invention employ a non-obvious combination of elements in forming the aluminum base alloy of the present invention, but that the prior art references cited by the Examiner in fact teach away from combining these elements, specifically, Be and V, as does the present invention. By way of explanation, Applicant respectfully explains as

follows. The addition of Be has been found to be particularly adapted to aluminum base alloys containing substantial amounts of magnesium which are employed in die casting operations. This is so because such alloys are typically exposed to elevated temperatures for a considerable length of time. The addition of beryllium to alloys used in making die casting tends to render the liquid metal relatively fluid and capable of filling the molds without introducing non-metallic inclusions and to the casting. Stroup acknowledges this at page 1, right column, lines 43-52.

It has been observed that the beryllium content of an aluminum magnesium alloy in a melt diminishes with time. Therefore, the amount of Be must be considerably higher if the formation of dross is to be prevented in the melt which is to be exposed for a long time (e.g., more than 50 hours) at elevated temperatures. Unfortunately, however, an increased addition of Be to a melt is undesirable because of the carcinogenic properties of beryllium and is sought to be avoided as far as is possible. As a result, a problem is formed to which the present invention offers a solution. Specifically, the present invention aims to reduce the formation of dross without the necessity of increasing the amount of Be in a case where a melt is exposed to elevated temperatures, particularly for a time period greater than 50 hours.

The present invention discloses the unexpected fact that the addition of a small amount of vanadium is sufficient to prevent

the formation of dross after more than 50 hours without the need of an increased amount of Be.

Applicant now respectfully turns to discussing the three cited prior art references with regards to the above-noted explanation. Stroup deals with the problem of dross formation on the surface of molten aluminum base alloys containing magnesium. To prevent the formation of dross, very small amounts of Be are added to the melt to prevent the oxidation of magnesium. An addition of .003 to .01% of Be is recommended (page 1, right column, line 42).

In addition, Stroup makes clear at page 2, left column, lines 47-51 what is meant by stating that melts used in die casting operations are often exposed to elevated temperatures for a considerable length of time. Specifically, Stroup cites a soaking time of six hours at a temperature of 1400 to 1500°F (760 to 816°) as being regarded as the most severe conditions sometimes encountered in foundry practice and to promote the formation of dross. From the table on page 2 at the bottom of the left column it can be seen that an addition of 50 ppm Be to an aluminum base alloy containing 10% Mg is sufficient to considerably reduce the amount of magnesium lost in the alloy compared to an alloy without Be. On page 2, right column, lines 3-5 it is stated that under less severe conditions that usually obtain in commercial operations, the losses are smaller. Stroup further discloses an addition of .1 to 1% V to increase the hardness of the alloy.

The Examiner has noted that the V content of Stroup is higher than that of the claimed invention. Applicant herein rebuts the *prima facie* case of obviousness arising from this observation. One skilled in the art would most emphatically not have expected the alloy of the present invention to possess the properties that it does.

Faced with an aluminum magnesium melt that must be capable of withstanding the formation of dross when exposed to more than 50 hours to elevated temperatures, a person skilled in the art would most definitely increase the Be content to a higher level than the claimed maximum of 50 ppm Be as claimed in the present invention. The reasons for this are as follows. As noted above, the addition to 50 ppm of beryllium reduces the amount of magnesium lost when held for a long period of time at elevated temperature. It has further been observed, as noted above, that the beryllium content of an aluminum magnesium alloy diminishes over time. Therefore, the obvious method of increasing the resistance to dross of an aluminum magnesium alloy held at elevated temperatures for an extended period of time would be to increase the amount of Be. As noted above, this is to be avoided as increasing the amount of beryllium possesses adverse consequences.

It is, however, an essential insight of the present invention that that which is obvious, namely adding more beryllium to the aluminum alloy melt, is in fact not at all necessary and it is therefore possible to avert many if not all

of the deleterious effects of increasing the beryllium content of the alloy. Specifically, the present invention has found that a small addition of vanadium is sufficient to prevent the formation of dross in an alloy held at an elevated temperature for more than 50 hours without the need of an increased amount of beryllium. It is this unexpected affect of V in combination with a small amount of beryllium regarding the prevention of dross formation that is illustrated in the results in table 2 on page 4 of the present specification. Applicant therefore wishes to make expressly clear that the combination of V with a small amount of Be provides entirely unexpected and non-obvious results regarding the prevention of dross formation and aluminum base alloy held for a long period of time at an elevated temperature.

With reference to Matsuo and EP 594509, both of these references teach wrought alloys that are processed to wrought products. In the slab casting operations used in the manufacturing of wrought products, the melt is exposed to elevated temperatures for a much shorter time than is the case with the manufacturing of castings or die casting operations. As such, neither reference teaches or suggests the combination of the elements of the present invention in the specific ranges claimed in the present invention. Both Matsuo and EP 594509 are drawn to an entirely different problem than that of the present invention and thus do not, taken alone or in combination, teach or suggest addressing the problem of dross formation in aluminum

alloy held for an extended period of time at an elevated temperature as does the present invention.

It is therefore Applicant's belief that the prima facie case of obviousness formed by the cited prior art references are overcome. Applicant therefore respectfully traverses the grounds for the Examiner's rejection. As a result, claims 15-25 are therefore believed to be in condition for allowance.

An earnest and thorough attempt has been made by the undersigned to resolve the outstanding issues in this case and place same in condition for allowance. If the Examiner has any questions or feels that a telephone or personal interview would be helpful in resolving any outstanding issues which remain in this application after consideration of this amendment, the Examiner is courteously invited to telephone the undersigned and the same would be gratefully appreciated.

It is submitted that the claims patentably define over the art relied on by the Examiner and early allowance of same is courteously solicited.

If any fees are required in connection with this case, it is respectfully requested that they be charged to Deposit Account

No. 02-0184
I hereby certify that full correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner of Patents and Trademarks, Washington, D.C. 20231

on April 2, 2003

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Respectfully submitted,

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